

PAPER • OPEN ACCESS

Preface

To cite this article: 2020 *J. Phys.: Conf. Ser.* **1521** 011001

View the [article online](#) for updates and enhancements.

You may also like

- [Designing Production Based Learning as a Basic Strategy for Creating Income Generating Units at Universitas Pendidikan Indonesia](#)
D Suryadi and N Supriatna
- [Assessment of miniaturized ultrasound-powered implants: an *in vivo* study](#)
Jesse Vo, Ting Chia Chang, Katherine I Shea et al.
- [A new Ultra Precision Interferometer for absolute length measurements down to cryogenic temperatures](#)
R Schödel, A Walkov, M Zenker et al.



The Electrochemical Society
Advancing solid state & electrochemical science & technology

242nd ECS Meeting

Oct 9 – 13, 2022 • Atlanta, GA, US

Extended abstract submission deadline: April 22, 2022

Connect. Engage. Champion. Empower. Accelerate.

MOVE SCIENCE FORWARD



Submit your abstract



Preface

Following up on efforts to improve the quality and quantity of international publications of lecturers and students of UPI (Indonesia University of Education) Postgraduate Schools, Master Program in Chemistry, Physics, Biology, Science and Mathematics Education and Doctor Program in Science and Mathematics Education collaboratively conducted International Conference on Mathematics and Science Education 2019 on Saturday 29 June 2019 at the Grand Mercure Setiabudi Bandung.

The theme of the conference was "Mathematics and Science Education Research for Sustainable Development", with coverage of Mathematics Education, Physics Education and STEM (Science, Technology, Engineering and Mathematics).

The main objective of this conference is to improve the academic atmosphere within the UPI environment, particularly at the UPI Postgraduate School and strengthen the lecturer and student publications through the International Conference on Mathematics and Science Education (ICMScE)2019. Specific objectives to be achieved regarding this conference are (1). Increase the number of scientific publications of lecturers and Postgraduate students in conference proceedings, and (2). Increase the number of citation index lecturers and students of the UPI Graduate School in the Master Program in Chemistry, Physics, Biology, Science and Mathematics Education and Doctor Program in Science and Mathematics Education.

At the Main Session, presentations were held and presentations were followed by discussions from 5 Keynote Speakers namely Prof. P. John Williams from Curtin University Australia, Prof. Kin Eng Chin from Flinders University Australia, Prof. Jun-Ki Lee from Chonbuk National University of South Korea, Prof. Shein Shin from Chungbuk National University in South Korea and Prof. Minshu Ha from Kangwon National University of South Korea. The Plenary Session has presented a presentation followed by discussion from 5 Invited Speakers namely Prof. Liliyasi (Chemistry Education), Prof. Nuryani Rustaman (Biology Education), Prof. Ari Widodo (Science Education), Dr. Parsaoran Siahaan (Physical Education) and Dr. Al-Jupri (Mathematics Education). At the Parallel Session, presentations and presentations were held followed by discussions from 269 presenters (263 presenters from Indonesia, 3 presenters from South Korea, 1 from Thailand, 1 from Malaysia, and 1 from Britain). At the Session Poster 139 presenters were present and presented the poster. The total participants were 423 people with the number of presenters as many as 408.

I would like to thank those who supported ICMScE 2019, especially the advisory board, scientific committee, and organizing committee for their invaluable contribution in organizing the conference and in the peer-reviewing process of selected papers. I sincerely hope that ICMScE 2019 had been a forum that facilitated excellent discussions for improving the quality of research and development of science education that promoted collaborative researches among participants.

Chairman of the Committee,



LIST OF COMMITTEES

STEERING COMMITTEE:

1. Prof. Dr. Asep Kadarohman, M.Si.
2. Prof. Dr. Didi Sukyadi, M.A.
3. Prof. H. Yaya Sukjaya Kusumah, M.Sc. Ph. D.
4. Prof. Dr. Hj. Anna Permanasari, M.Si.
5. Prof. Dr. Disman, M.S.
6. Siti Fatimah, S.Pd, M.Si, Ph.D.

INTERNATIONAL ADVISOR BOARDS:

1. Prof. Kin Eng Chin (Flinders University, Australia)
2. Prof. Minsu Ha (Kangwon National University, South Korea)
3. Prof. Junki Lee (Chonbuk National University, South Korea)
4. Prof. Sein Shin (Chungbuk National University, South Korea)
5. Prof. Claudia Bohmann Linde (Wuppertal University, Germany)
6. Prof. H. Yaya Sukjaya Kusumah, M.Sc. Ph. D. (Universitas Pendidikan Indonesia, Indonesia)
7. Prof. Dr. Hj. Nuryani Y. Rustaman, M.Pd. (Universitas Pendidikan Indonesia, Indonesia)
8. Prof. Dr. Liliarsari, M.Pd, (Universitas Pendidikan Indonesia, Indonesia)

SCIENTIFIC COMMITTEE:

1. Prof. Dr. Phil. Ari Widodo, M.Ed.
2. Dr. Riandi, M.Si.
3. Dr. Bambang Supriatno, M.Si.
4. Dr. Sufyani Prabawanto, M.Ed.
5. Dr. Taufik Ramlan Ramalis, M.Si.

Chairman:

Dr. Ahmad Mudzakir, M.Si.

Leader Executive:

1. Erwin
2. Muhammad Satriawan

Secretary:

General Secretary: Fitri Khoerunnisa, M.Si., Ph.D.

Secretary 1: Rika Rafikah Agustin

Secretary 2: Muhammad Syaipul Hayat

Secretary 3: Ari Syahidul Sihidiq (IPA-S3)

Treasurer:

1. Dr. Hernani, M.Si.
2. Dr. Winny Liliawati, M.Si.
3. Jumrodah

PAPER REVIEWER:

1. Dr. Galuh Yuliani, M.Si
2. Tuszie Widhiyanti, M.Pd., Ph.D.
3. Fitri Khoerunnisa, M.Si., Ph.D.
4. Dr. Siti Aisyah, M.Si.
5. Dr. Eni Nuraeni, M.Pd.
6. Al Jupri, M.Ed, Ph.D
7. Dr. Ahmad Samsudin, M.Pd
8. Dr. Ridwan Efendi, M.Pd
9. Dr. Hernani, M.Si.
10. Dr. Winny Liliawati, M.Si.
11. Heli Siti Halimatul M., M.Si., Ph.D.
12. Dr. Elah Nurlaelah, M.Si.
13. Dr. Yayan Sanjaya, M.Si.
14. Dr. Diah Kusumawaty, M.Si.
15. Dr. Rini Solihat, M.Si
16. Dr. Al Azhary Masta, M.Si.
17. Dr. Kartika Yulianti, M.Pd.
18. Isnje Yusnitha, S.Si., M.Ed.
19. Dr. Bambang Avip Priatna
20. Dr. Imam Albania
21. Prof.Dr. Rizky Rosjanuardi
22. Suhendra, M.Ed. Ph.D
23. Irma Rahma Suwarma, M.Pd., Ph.D.
24. Dr. Achmad Samsudin, M.Pd.
25. Dr. Lilik Hasanah, M.Si.
26. Dr. Endi Suhendi
27. Dr. Eka Cahya Prima, M.T.

Table of contents

Volume 1521

2020

◀ Previous issue Next issue ▶

Mathematics Education

Accepted papers received: 26 March 2020

Published online: 22 May 2020

Open all abstracts

Mathematics Education

OPEN ACCESS 032001

Analysis of elementary student's mathematical connection and communication ability

I Pertiwi and Wahyudin

+ Open abstract  View article  PDF

OPEN ACCESS 032002

Students' difficulties in solving trigonometric equations and identities

S M Rohimah and S Prabawanto

+ Open abstract  View article  PDF

OPEN ACCESS 032003

Operation sense in algebra of junior high school students through an understanding of distributive law

L Ardiansari and Wahyudin

+ Open abstract  View article  PDF

OPEN ACCESS 032004

Relationship between reversible reasoning and conceptual knowledge in composition of function

M Ikram, Purwanto, I N Parta and H Susanto

+ Open abstract  View article  PDF

Effectiveness of student worksheets on environmental project-based e-learning model in building student character

I Sarah and S Rani

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032006

Integrating ethnomathematics into augmented reality technology: exploration, design, and implementation in geometry learning

S Sudirman, R P Yaniawati, M Melawaty and R Indrawan

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032007

Analysis of difficulties for pre-service mathematics teacher in problem solving of division and divisibility based on theory of action, process, object, and schemes

Y Fitrianti, D Suryadi and Kusnandi

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032008

Javanese traditional games as a teaching and learning media to socialize and introduce mathematics since early age

A D Handayani and V Iswantiningtyas

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032009

Characteristics of students' mathematical representation in solving algebraic thinking problems

Y H Nada, S Prabawanto and Suhendra

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032010

The application of ICT learning through Hippani: the effects on mathematical reasoning ability

U Umbara, Munir, R Susilana and E F W Puadi

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032011

Attitude towards statistics among pre-service teachers of institute of teacher education

A A Mustam, M Adnan, J Johnny and M A B Setambah

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032012

This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our privacy and cookies policy.



[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032013

Introducing local wisdom by numbering and reading

I M Pratiwi and V A N Ariawan

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032014

The effectiveness of blended learning to improve pre-service teacher TPaCK in developing multimedia learning mathematics at elementary school

M Sintawati and G Abdurrahman

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032015

Contextual approach with scaffolding: an effort to improve student's mathematical critical thinking

Y Sunaryo and A T Fatimah

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032016

Students mathematical communication ability in geometry

T R Pangaribuan, B A P Martadiputra, D Usdiyana and R O Sihotang

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032017

Metacognition skills of the gifted and talented students

R O Sihotang, Kusnandi and E E Hutagalung

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032018

Pupils Inter-dialogue in the Context of Problem Solving Polyhedron Geometry in Junior High School: Phenomenological Studies

A S Maulida, D Dasari and D Suryadi

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS


032019

The development of interactive mathematics learning media based on local wisdom and 21st century skills: social arithmetic concept

H Pujiastuti, R R Utami and R Haryadi

[+ Open abstract](#) [View article](#) [PDF](#)
This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our Privacy and Cookies policy.



-
- OPEN ACCESS** 032020
The role of agricultural contextual knowledge on the mathematical understanding of vocational students
A T Fatimah, W Wahyudin and S Prabawanto
[+](#) [Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 032021
Assessment problems of junior high school teachers in implementing 2013 Indonesian curriculum
S Morin, S Prabawanto and T Herman
[+](#) [Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 032022
Learning trajectory of modeling situation problems utilizing tables and diagrams for elementary school students
V Pratiwi, T Herman, D Suryadi, S Aryanto, Y Gumala, N Nurkaeti and L Farokhah
[+](#) [Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 032023
Analysis of students critical thinking ability in solving trigonometric problems
M E Nggaba
[+](#) [Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 032024
The analysis of reflective thinking ability in junior high school students
Rosmaya and SH Noer
[+](#) [Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 032025
Improving students mathematical higher order thinking through the implementation of the creative problem-solving model of High School Students
A Effendi and A T Fatimah
[+](#) [Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 032026
Analysis of junior high school students' spatial ability based on Van Hiele's level of geometrical thinking for the topic of triangle similarity
M K Lutfi and A Jupri
[+](#) [Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 032027
This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our Privacy and Cookies policy. 

Developing a didactical design: the distance between a point and a line in three dimensional shape

W K H W Putri, D Suryadi and E Mulyana

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032028

Epistemological Obstacles: An Overview of Thinking Process on Derivative Concepts by APOS Theory and Clinical Interview

A Prihandhika, S Prabawanto, T Turmudi and D Suryadi

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032029

Student's Mistake in Algebraic Fraction: An Analysis Using AVAE Categories

B I Zulfa, D Suryadi, S Fatimah and A Jupri

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032030

Enhancement of mathematical creative thinking ability through open-ended approach based on metacognitive

N Nurkaeti, Turmudi, Karso, V Pratiwi, S Aryanto and Y Gumala

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032031

Relationship between intelligence quotient, gender, learning outcomes and geometry thinking levels

E Sudihartinih and Wahyudin

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032032

Contextual mathematical problem solving of deaf students based on the montague stages

I Muhafidin, E Nurlaelah and A Hasanah

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032033

The effect of think-pair-share cooperative learning on student mathematical communication skills

A Irma, D Juandi, J A Dahlan and R Nirawati

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032034

The correlation among students' response in apply problem based learning and cognitive conflict strategy to improve critical thinking skills and curiosity attitude based on academic level

Zetrisulita, Wahyudin and Jannah

This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our Privacy and Cookies policy.



[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032035

Error analysis in solving prism and pyramid problems

A N Hasanah and K Yulianti

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032036

An analysis of tenth grade students' mathematical creative thinking ability in vector

Y Hilmi and D Usdiyana

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032037

The relationship between mathematics resilience and mathematics communication skills

Rifdah and N Priatna

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032038

Education for industry revolution 4.0: using flipped classroom in mathematics learning as alternative

Rahmadani, T Herman, S Y Dareng and Z Bakri

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032039

Relationship between mathematical creative thinking ability and student's achievement in gender perspective

Marzuki, E Cahya and Wahyudin

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032040

PGSD student's mathematical creative thinking skills judging from creativity quotations by making vba-based teaching

S Murni, M Bernard, S Ruqoyyah and S Chotimah

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032041

The analysis of mathematics problem-solving skills and its relation with self-efficacy on the students of MTsN 2 Pematang

I Sayekti, S B Waluya, Rochmad and A Johan

[+ Open abstract](#) [View article](#) [PDF](#)

This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our [Privacy and Cookies policy](#).



OPEN ACCESS	032042
Ethnomathematics: exploration of a mosque building and its ornaments	
T Purniati, Turmudi and D Suhaedi	
+ Open abstract	View article
PDF	
OPEN ACCESS	032043
Critical thinking skills and self-confidence of high school students in learning mathematics	
D Adharini and T Herman	
+ Open abstract	View article
PDF	
OPEN ACCESS	032044
Logical thinking skills of primary school teachers	
M G Ristiana, D Suryadi and E Cahya	
+ Open abstract	View article
PDF	
OPEN ACCESS	032045
Critical thinking skills in integral calculus lecture based on mathematical dispositions	
B E Susilo, D Darhim and S Prabawanto	
+ Open abstract	View article
PDF	
OPEN ACCESS	032046
Senior high schools teachers and students' needs for the e-learning in a remedial program of mathematics	
P Sasalia, S T F Abidin and Mailizar	
+ Open abstract	View article
PDF	
OPEN ACCESS	032047
Mathematics anxiety of senior high school students based on extrovert and introvert personality types	
S N Azizah and Suhendra	
+ Open abstract	View article
PDF	
OPEN ACCESS	032048
Application of react (relating, experiencing, applying, cooperating, transferring) strategy to improve mathematical communication ability of junior high school students	
M A Musyadad and B Avip	
+ Open abstract	View article
PDF	
OPEN ACCESS	032049
Ethnomathematics: Beyond Formalizing mathematical representation in the <i>Mofo</i> but more, reading Praditya and G. M. Kurniawan	



[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032050

Statistical literacy of undergraduate students in Indonesia: survey studies

Lukman and Wahyudin

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032051

Preliminary analysis of problem-based statistical learning media

Hamdunah, S Handayani and L H Jufri

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032052

The influence of realistic mathematics education (RME) approach in enhancing students' mathematical literacy skills

R Fauzana, JA Dahlan and A Jupri

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032053

The level of mathematical resilience and mathematical problem-solving abilities of 11th grade sciences students in a senior high school

K Harsela and E C M Asih

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032054

Students' creative thinking skill and its influential factors in quadrilateral topic viewed by students' cognitive

D Rupalestari and S Prabawanto

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032055

How are the contributions of mathematics resilience for developing attitude rubric to assess mathematics learning?

A Suri and T Herman

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032056

Mathematics remedial teaching under model of countenance stake for a senior high school in Bandung

D E Ruses and S Prabawanto



[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032057

Pedagogical content knowledge (PCK) profile of prospective teachers in mathematics learning

S Y Ningsih, Turmudi and D Juandi

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032058

An analysis of junior high school students' creative thinking skills in solving flat-side geometry problems

R R Musna and D Juandi

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032059

An analysis of mathematical reflective thinking skills of senior high school students

R Ramadhani and D Juandi

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032060

Analysis of students' mathematical reflective thinking skills and habits of mind

I D Martyaningrum and S Prabawanto

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032061

Pre-service mathematics teachers creativity in designing mathematics assessment based on education for sustainable development

I Widiati, Turmudi and D Juandi

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032062

The analysis of students' learning difficulties on system of linear equation in two variables topic

N A Fatio, S Fatimah and R Rosjanuardi

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032063

Analysis of student's statistical thinking ability in understanding the statistical data

M Masjudin, A Muzaki, Z Abidin and I A P Ariyanti

[+ Open abstract](#) [View article](#) [PDF](#)

This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our [Privacy and Cookies policy](#).



OPEN ACCESS	032064
Rounding-augmented reality book and smartphone for deaf students in achieving basic competence	
A Hasanah, Y S Kusumah and K Rahmi	
+ Open abstract View article PDF	
OPEN ACCESS	032065
The differences of mathematics students' entrepreneurship motivation in facing the digital era between students who have and have not taken entrepreneurship course	
T Rohaeti and P Rustika	
+ Open abstract View article PDF	
OPEN ACCESS	032066
An analysis of the cause factors of unreachable standard minimum criteria on mathematics learning	
Y F Aziiza and T Herman	
+ Open abstract View article PDF	
OPEN ACCESS	032067
Students' critical thinking ability in solving contextual problems at a junior high school	
I Kurnia and Caswita	
+ Open abstract View article PDF	
OPEN ACCESS	032068
Education for sustainable development: investigating the sustainability consciousness and mathematical competence in the geometry for middle school students	
Anwar, D Juandi and S Y Ningsih	
+ Open abstract View article PDF	
OPEN ACCESS	032069
Designing symbol sense tasks: the case of quadratic equations	
A Jupri and R Sispiyati	
+ Open abstract View article PDF	
OPEN ACCESS	032070
Mathematical communication ability analysis of high school students on trigonometry learning	
U Ekaludini and D Darhim	
+ Open abstract View article PDF	
OPEN ACCESS	032071
Students' difficulty in solving algebra task in middle school	

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032072

Hybrid-PjBL: Creative thinking skills and self-regulated learning of pre-service teachers

N E Zakiah and D Fajriadi

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032073

Fraction interpretation of pre-service mathematics teachers

W Ramadianti, N Priatna and D Suryadi

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032074

Enhancement of reasoning skills of 7th grade students using Malcolm's modeling based on KWL thinking strategy

A Johan, A Suyitno, Mashuri and I Sayekti

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032075

Comparison of mathematical literacy enhancement between students with problem-based learning and guided discovery learning model

M Hafiz, Darhim and J A Dahlan

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032076

Promoting junior high school students' active learning using concrete object demonstration in line and angle topic

A Khomeni and S Prabawanto

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032077

Students' algebraic thinking: a study of mathematical modelling competencies

F Fakhrunisa and A Hasanah

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032078

Senior high school students' problem-solving ability in completing sine rule problems

S Wahyuni and J A Dahlan

[+ Open abstract](#) [View article](#) [PDF](#)



OPEN ACCESS	032079
On surveying of fifth grade mathematical anxiety in term of gender	
N F Afrianti and S Prabawanto	
+ Open abstract	View article
PDF	
OPEN ACCESS	032080
Analysis of elementary school students' ability on mathematical communication and mathematical representation	
R R Fauziyah and A Jupri	
+ Open abstract	View article
PDF	
OPEN ACCESS	032081
The factors that influence students' solution related to inverse proportion problems	
A F P Alam, Suhendra and S Prabawanto	
+ Open abstract	View article
PDF	
OPEN ACCESS	032082
Intuition characteristics of junior high school students with rational personality types in solving HOTS mathematical problems	
B E Nugroho, B Usodo and S Subanti	
+ Open abstract	View article
PDF	
OPEN ACCESS	032083
The ability of teacher using properties "bloker" through scientific approach in learning mathematics	
Saiman, M Zaki and P Wahyuningsih	
+ Open abstract	View article
PDF	
OPEN ACCESS	032084
Students' creative thinking skills on the circle subject in terms of learning obstacle and learning trajectory	
N Diana, D Suryadi and Dahlan	
+ Open abstract	View article
PDF	
OPEN ACCESS	032085
Creativity of mathematics education students in producing instructional media-based on macromedia flash through blended learning	
P Fitriasari, D Octaria and N Sari	
+ Open abstract	View article
PDF	
OPEN ACCESS	032086
This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our Privacy and Cookies policy.	



The qualitative effect of problem-based learning model toward students' mathematical imitative and creative reasoning

N Permatasari, A Jupri and Darhim

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032087

Binomial distribution at high school: An analysis based on learning trajectory

I Taufiq, F Sulistyowati and A Usman

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032089

The didactical and epistemological obstacles on the topic of geometry transformation

L Sunariah and E Mulyana

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032090

Structure analysis of indonesian mathematics textbooks in the topic of relation and function for junior high school

F J Firdausi and A Jupri

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032091

The influence of realistic mathematics education toward students' mathematical habit of mind enhancement in elementary school

S Nisa, Turmudi and S Saragih

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032092

Analysis of elementary student's mathematical connection and communication ability

I Pertiwi and Wahyudin

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032093

Didactic transposition from scholarly knowledge of mathematics to school mathematics on sets theory

J Jamilah, D Suryadi and N Priatna

[+](#) Open abstract [View article](#) [PDF](#)

OPEN ACCESS

032094

Social justice in mathematics education for sustainable development

S Mawarti and E Nurcaelan

This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our Privacy and Cookies policy.



[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032095

Gender and mathematical communication ability

N H Firdiani, T Herman and A Hasanah

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032096

Development of high order thinking skills (HOTS) test instrument on exponent for junior high school students

M Zaki, R Amalia and S Sofyan

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032097

Assessment processes for slow learners in mathematics learning

U Khaira and T Herman

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032098

Moodle-based e-learning development based on mathematical solving of high school students

S Nurjanah and E C Mulyaning

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032099

Mathematical connection ability of middle school students in solving quadrilateral

Novianti, B A P Martadiputra and N Priatna

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032100

Comparison of exponential smoothing method and autoregressive integrated moving average (ARIMA) method in predicting dengue fever cases in the city of Palembang

E Munarsih and I Saluza

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 032101

The exploration of ethnomathematics in the cultural heritage of musi rawas regency through ethnographic studies

D Friansah and Y Yanto

[+ Open abstract](#) [View article](#) [PDF](#)

This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our [Privacy and Cookies policy](#).



OPEN ACCESS

032102

Improving mathematical critical thinking skills through problem-based learning

A O Samura, Dadang Juandi and Darhim

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032103

Development of Geometry Analysis Using Geogebra Scripting in terms of Student Cognitive Capabilities

M Bernard and W Setiawan

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032104

Analysis toward relationship between mathematical literacy and creative thinking abilities of students

M Fitriawanati, M Sintawati, Marsigit and E Retnowati

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032105

The effect of smartphone usage on student discipline, motivation and learning achievement

S Irna

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

032106

Mathematical abstraction: students' concept of triangles

E E Hutagalung, E Mulyana and T R Pangaribuan

[+ Open abstract](#) [View article](#) [PDF](#)

JOURNAL LINKS

[Journal home](#)

[Journal Scope](#)

[Information for organizers](#)

[Information for authors](#)

[Contact us](#)

[Reprint services from Curran Associates](#)



PAPER • OPEN ACCESS

The effectiveness of blended learning to improve pre-service teacher TPaCK in developing multimedia learning mathematics at elementary school

To cite this article: M Sintawati and G Abdurrahman 2020 *J. Phys.: Conf. Ser.* **1521** 032014

View the [article online](#) for updates and enhancements.



IOP | ebooks™

Bringing together innovative digital publishing with leading authors from the global scientific community.

Start exploring the collection—download the first chapter of every title for free.

The effectiveness of blended learning to improve pre-service teacher TPaCK in developing multimedia learning mathematics at elementary school

M Sintawati^{1*} and G Abdurrahman²

¹Prodi PGSD, Universitas Ahmad Dahlan, Jl. Ki Ageng Pemanahan No. 19 Sorosutan, Yogyakarta 55162, Indonesia

²Prodi Teknik Informatika, Universitas Muhammadiyah Jember, Jl. Karimata No. 49 Jember, Jawa Timur 68121, Indonesia

*Corresponding author's email: mukti.sintawati@pgsd.uad.ac.id

Abstract. This study aims to determine the effectiveness of blended learning towards the improvement of pre-service teacher TPaCK (Technological Pedagogical Content Knowledge) in developing multimedia learning mathematics in elementary schools. The type of this research is a quasi-experimental design. The research method used is a non-equivalent control group design. The population of this study was the 6th-semester students of the 2018/2019 academic year of the PGSD UAD study program of 315 students grouped in 7 classes. The sample used was an experimental class of the class controller drawn at random. The method of collecting data uses observations in multimedia learning mathematics that have been developed by pre-service elementary school teachers. The research instrument used the TPaCK assessment sheet that had been taken expert validation. The results of the study showed that at a significance level of 5% blended learning was effective in increasing the TPaCK of pre-service teachers in developing multimedia learning mathematics in elementary schools.

1. Introduction

The emergence of the fourth generation industrial revolution or also called the industrial revolution 4.0 is the impact of the development of increasingly rapid science and technology. To face the industrial revolution 4.0, Yogyakarta Special Province has prepared itself with the Jogja Smart Province scheme. Jogja Smart Province is a grand design to stimulate the growth of innovation in utilizing digital technology in all aspects of services in the province of DIY, including aspects of education services.

Education in Yogyakarta is one of the aspects that is very much considered in the Jogja Smart Province scheme, especially Yogyakarta, has the title as a student city. In Yogyakarta, there are also many LPTK (educational institutions and education staff) who also prepare students to become pre-service teachers who are ready to face increasingly rapid technological developments, one of which is the Elementary School Teacher Education study program Ahmad Dahlan University (PGSD UAD). To support the Jogja Smart Province scheme, PGSD UAD students are prepared to become competent pre-service elementary school teacher not only in terms of professionalism, pedagogical, social, and personality but also in using technology. It is by the 2007 national education minister's regulation, which states that a teacher must have competence in information and communication technology. Competence



in the field of information and communication technology serves to develop itself and as a support for the learning process [1].

The use of technology in the learning process requires competent teachers. Competent in question is a teacher who can integrate professional skills, pedagogical abilities, and technology in learning. These three abilities, according to Koehler and Mishra, are referred to as Technological Pedagogical Content Knowledge (TPaCK) [2]. TPaCK is a theoretical framework to measure the ability of teachers to integrate technology into learning. There are seven components in TPaCK namely 1) Technological knowledge (TK), 2) Pedagogical knowledge (PK), 3) Content knowledge (CK), 4) Technological Content Knowledge (TCK), 5) Pedagogical content knowledge (PCK), 6) Technological content knowledge, 7) Technological Pedagogical Content Knowledge (TPaCK) [3].

Technological Knowledge (TK) is the knowledge of pre-service teachers about what and how technology, software, or applications can be used for learning. Pedagogical knowledge (PK) is knowledge of student characteristics, development of learning plans and evaluation of learning outcomes, and what are the methods /models/learning strategies that can be used in mathematics learning in elementary school. Content knowledge (CK) is the mastery of pre-service teachers in the subject matter of mathematics widely and deeply. Technological Content Knowledge (TCK) is the ability of teachers to deliver material using technology. Pedagogical content knowledge (PCK) is the ability to deliver material to students. In delivering material, the teacher does not only give material but uses specific strategies in delivering material [4]. Technological Pedagogical Content Knowledge (TPaCK) is the teacher's ability to carry out mathematics learning by integrating learning strategies and technology [5].

The ability of TPaCK is essential for elementary school pre-service teachers because pre-service teachers who have the capability of TPaCK can integrate technology in the learning process according to the learning material and learning strategies that are appropriate to the characteristics of students. The use of technology, according to Drijvers, Boon, and Van Reeuwijk in the learning process, is beneficial for students in understanding subject matter, especially mathematics subjects [6]. It is common knowledge that mathematical material is abstract. Though, the level of cognitive thinking of elementary school students according to Piaget is still a concrete operational nature. The task of elementary school pre-service teachers is to design abstract mathematical learning to be more concrete, contextual, or more realistic according to the level of thinking of students. NCTM also provides effective teacher ideas. Effective teachers are expected to be able to utilize the potential of technology to develop student understanding, stimulate interest in learning, and improve students' mathematical skills [7]. However, the research conducted by Sutama shows that mathematics learning in elementary schools tends to be textbook oriented and less contextual so that mathematical concepts are difficult to understand and result in mathematics learning outcomes that are less than expected [8].

The emergence of technology in mathematics learning is one strategy that can be used to make abstract mathematical concepts more concrete. Aija and Inga describe various benefits of technology in the learning process, namely increasing student learning motivation because mathematical content presented in accordance with the development of the digital era, helps students associate concepts with the initial abilities students have, helps teachers create a different learning atmosphere, a more visual learning process, concrete, fun, and interesting [9]. Research conducted by Mehmed shows that graphics calculator technology and graphics programs improve students' mathematical abilities [10].

The great benefits of using technology in mathematics learning in elementary schools are considered by the UAD PGSD study program to prepare students to become pre-service teachers who have superior TPaCK. One thing that can be done to develop the ability of TPaCK students is to use the blended learning method in the learning process at the University. Blended learning is a combination of face-to-face learning with learning using e-learning [11]. Blended learning aims to help educators develop a better learning process; providing opportunities for individual learning practices, easy to use, and continues to develop; and increase the flexibility of the learning schedule. Face-to-face learning can be used for interactive experiences with educators, while online classes provide a lot of knowledge content that can be accessed by pre-service teachers whenever and wherever as long as they have internet access

[12]. Learning using blended learning has benefits, namely Flexibility, which means that pre-service teachers can contribute to learning at their own chosen time and place [13]. Kintu, Zhu, & Kagambe also mention some of the benefits of blended learning, namely, effective and efficient learning, pre-service teachers can discuss with lecturers outside of face-to-face hours, not spend too much energy to teach, and broader learning range [14]. Learning using blended learning is also effective in developing the character of pre-service teachers who are communicative, creative, curious, and hard-working [15].

PGSD Study Program UAD has e-learning that can be used for the online learning process. The e-learning in this study was used for blended-learning. The purpose of the use of e-learning is to look at the effectiveness of blended learning to improve pre-service teacher training in developing multimedia learning mathematics in elementary schools.

2. Methods

This research was conducted at the elementary school education study program of Ahmad Dahlan University (PGSD UAD). This study used a quasi-experimental design with non-equivalent control group design. The population of this study was the 6th-semester students of the 2018/2019 academic year of the PGSD UAD study program of 315 students grouped in 7 classes. The sample used was one experimental class, and one control class has taken randomly. Experimental class and class control, each consisting of 45 students. The experimental class uses the blended learning model (expository and multimedia doing exercises based on e-learning), while the control class uses regular learning (expository and direct multimedia-making exercises).

The research data is a TPaCK score. The method of collecting data uses observations in multimedia learning mathematics that have been developed by pre-service elementary school teachers. Multimedia learning developed using the Macromedia flash application. The research instrument uses TPACK assessment sheets that have been validated by experts. The assessment sheet consists of 20 points of assessment with a Likert scale, which has five alternative answers, namely very high, high, moderate, low, and very low as shown in Table 1.

Table 1. Interval and TPaCK criteria

Interval	Criteria
$X > (\bar{X}_i + 1.8 s_i)$	Very High
$(\bar{X}_i + 0.6 s_i) < X \leq (\bar{X}_i + 1.8 s_i)$	High
$(\bar{X}_i - 0.6 s_i) < X \leq (\bar{X}_i + 0.6 s_i)$	Moderate
$(\bar{X}_i - 1.8 s_i) < X \leq (\bar{X}_i - 0.6 s_i)$	Low
$X \leq (\bar{X}_i - 1.8 s_i)$	Very Low

The analysis technique used is parametric statistics. One sample t-test used to test the effectiveness of the blended learning and regular models while comparing the blended learning and regular models using the independent sample t-test.

3. Result and Discussion

Table 2 present a description of the data from the TPaCK assessment of pre-service teacher elementary school in the blended-learning class and regular class.

Table 2. Data description of TPaCK assessment results

Description	blended-learning	Regular
Average	67.76	63.42
Standards deviation	4.2	3.31
Max empirical score	82	67
Max ideal score	100	100

Description	blended-learning	Regular
Min empirical score	61	58
Min ideal score	20	20

Based on Table 1, the average assessment TPaCK pre-service teacher in blended-learning class is 67.76. The average TPaCK results of the blended-learning class based on the assessment criteria in Table 1 fall into the high criteria, while the average TPaCK in the regular class is 62.93 in the moderate criteria.

Data on the results of TPaCK assessment of elementary school pre-service teacher are converted into very high, high, moderate, low, very low criteria. Table 3 present the frequency distribution and percentage of TPaCK assessment scores are presented.

Table 3. Distribution of Frequency and Percentage of TPaCK

Criteria for	Blended-learning		Regular	
	f	%	F	%
Very High	3	6.67	1	2.22
High	28	62.22	7	15.56
Moderate	14	31,1	37	82.22

Data in Table 3 shows that the TPaCK frequency distribution in blended-learning and regular classes are equally in the criteria of moderate, high, and very high. However, the highest frequency of the blended learning class is in the high criteria while the regular class is in the moderate category. In both classes there were none in the low and very low categories.

The average results of TPaCK assessment of elementary school teachers based on TPaCK aspects are presented in Table 4.

Table 4. Average results of TPaCK assessment

Aspect	Blended-learning		Reguler	
	Average	criteria	Average	Criteria
TK	3.67	High	2.71	Moderate
CK	3.84	High	3.71	High
PK	3.34	High	3.53	High
TCK	3.35	High	3.32	Moderate
TPK	3.29	Moderate	3.07	Moderate
PCK	3.22	Moderate	3.2	Moderate
TPaCK	3.19	Moderate	2.76	Moderate

Table 4 shows that the technological aspect of knowledge of elementary school pre-service teachers in the blended learning class is in the high category, while in the regular class is in the moderate category. It means that elementary school pre-service teachers in the blended learning class can use the Macromedia flash application such as creating navigation buttons, creating animations, making moving images, and entering sounds well. The aspect of content knowledge is at high criteria in both classes. It means that the mathematical material developed is correct according to the concept, indicators developed following basic competencies, and the questions developed can be used to measure material competencies to be achieved. Pedagogical knowledge aspects are also at high criteria in both classes. It means that elementary school pre-service teachers master the understanding of the scientific approach and its stages well. The Technological Content Knowledge aspect is in the high criteria in the blended

learning class, while in the regular class, the criteria are moderate. It indicates that elementary school pre-service teachers in the blended learning class can present material and separate parts of the material into flash-based multimedia accurately. The technological aspects of pedagogical knowledge are in the moderate criteria in both classes. It means that the scientific stages appear in the developed mathematical multimedia. The Pedagogical Content Knowledge aspect is in the moderate criteria in both classes. It means that the material is presented according to the scientific stage. The technological pedagogical content knowledge aspect is in the moderate category in both classes. It shows that the pre-service teacher has been able to present mathematical material according to the scientific stages in multimedia learning. Teacher candidates can also make questions and assessments in multimedia learning mathematics.

After the data has been described, then hypothesis testing is carried out to test the effectiveness of blended-learning. However, before the assumption of normality and homogeneity was tested. The results of normality and homogeneity tests are presented in Table 5 and Table 6.

Table 5. Normality Test Results

Class	p value	Description
Blended-learning	0.232	Normal
Regular	0.423	Normal

Table 5 shows that p-value in both classes is higher than 0.05 means the assumption of normality is fulfilled. The homogeneity of variance test results in both classes is presented in Table 6.

Table 6. Test Results Homogeneity of variance

Class	p value	Description
blended-learning	0.083	Homogeneous
regular	0.307	Homogeneous

Table 6 shows that the p-value greater than 0.05 means that the variance in both homogeneous class so that the assumption of homogeneity is fulfilled. Because the assumptions of normality and homogeneity have been fulfilled, it is continued by testing one sample t-test to test the effectiveness of learning in blended learning and regular class. The result of one sample t-test is presented in Table 7.

Table 7. Results one sample t-test

Classroom	p-value	Description
blended-learning	0.211	Rejected
regular	0.072	Rejected

Table 7 shows that the p-value more significant than 0.05 test decision. The hypothesis in both classes was rejected, meaning learning using blended learning and regular learning was effective in learning to improve TPaCK. To see which learning is more effective, proceed with the test of independent samples test. The test results of the independent samples test are presented in Table 8.

Table 8. Test Results independent test samples

p value	Description
0.042	Rejected

Table 8 shows that the p-value is smaller than 0.05 the decision of the hypothesis test is rejected, meaning learning using blended learning is more effectively used in learning to improve TPaCK. The results of this study corroborate the results of Ghaida's research, Petra, & Joke that learning with blended learning can develop pre-service teacher TPKCK [16]. Ghaida, Petra, & Joke also added that blended

learning made pre-service teachers more independent in finding learning resources. Learning resources provided online that contain assignments and activities are thought to be able to improve attitude, competence, and confidence in integrating ICT in the learning process. It is because exploring learning materials available online can help teachers better understand the learning that is integrated with ICT so that it can develop TPaCK [17].

4. Conclusion

The results of this study indicate that effective blended learning is used to improve TPaCK for elementary school pre-service teachers. Pre-service teachers are more flexible in learning to develop multimedia learning whenever and wherever as long as they have an internet connection at online learning sessions. While the face to face session is used to discuss with lecturers. Therefore blended learning can be an alternative that can be used to develop the technological capabilities of elementary school pre-service teachers.

5. References

- [1] Menteri Pendidikan 2007 *Standar kualifikasi akademik dan kompetensi Guru* (Jakarta: Permen Diknas)
- [2] Koehler M J and Mishra P 2009 *Contemporary issues in technology and teacher education*. **9** pp 60
- [3] Agyei D D and Voogt J 2012 *Australasian Journal of Educational Technology* **28** pp 547
- [4] Loughran J, Berry A and Mulhall P 2012 *Understanding and developing science teachers' pedagogical content knowledge* (Rotterdam: Sense Publisher) pp 8
- [5] Chai C S, Koh J H, Tsai C C and Tan L L 2011 *Computers & Education* **57** pp 1184-1193
- [6] Drijvers P, Boon P and Van Reeuwijk M 2010 *Algebra and technology secondary school algebra: Revising topics and themes and exploring the unknown* (Rotterdam: sense publishers) pp 136
- [7] National Council of Teachers of Mathematics 2015 *Strategic use of technology in the teaching and learning* (Reston: NCTM) pp 2
- [8] Utama S and Putro K I 2013 *Delta Jurnal Ilmiah Pendidikan Matematika FKIP Universitas Pekalongan* **1** 1
- [9] Aija C and Inga S 2012 *Journal of Procedia-Social Behavioural Science* **69** pp 1481
- [10] Ocak M A 2008 *Eurasia Journal of Mathematics Science and Technology Education* **4** pp 337
- [11] Mahdan D, Kamaludin M, Wendi H F and Simanjuntak M V 2018 *IOP Conference Series: Material Science Engineering* **306** pp 012026
- [12] Kaye T 2003 *Blended learning how to integrate online and traditional learning* (London: Kogan Page Limited) pp 20
- [13] Graham C, Allen S and Ure 2005 *M. Khosrow-Pour (Ed.) Encyclopedia of information science and technology I-V* (Heshey PA: Idea Group Inc) pp 4
- [14] Kintu M J, Zhu C and Kagambe E 2017 *International Journal of Education Technology in higher Education* **14** 7
- [15] Fisher D and Kusuma Y S 2018 *Journal of physic: Conference series* **1132** pp 012040
- [16] Alayyar G M, Fisser P and Voogt J 2012 *Australasian journal of educational technology* **28** pp 1298
- [17] Voogt J, Almekinders M, Van den Akker J and Moonen B A 2005 *Computers in Human Behavior* **21** pp 523